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Obstetric Forceps

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THE PENDULUM LEVERAGE OF THE OBSTETRIC FORCEPS.

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Philadelphia.

AN essential condition of the direction of traction with the obstetric forceps upon which I would insist, for the greater safety of the mother and child, especially for the integrity of tissues of the former, and prompt relief of the latter, is that *it shall be made steadily in the median line, with no lateral or pendulum motion.* There is no rule of practice in reference to forceps delivery upon which I have more strenuously insisted to my medical classes for fourteen years, from the beginning of my function as a preceptor, than this. Founding my instructions upon what have always been to me clear and self-evident truths, theoretically, and having the most satisfactory confirmation of them in their practical working, I have been, perhaps, doubly earnest in maintaining them because the great majority of modern teachers are against them. To me the position that I have held in regard to this rule of practice has seemed so thoroughly indisputable and, beyond question, without an assailable point, that it has been a marvel to me that teachers should so persistently hold to the contrary. As I look upon it, the leverage power of the forceps, ordinarily ascribed to the pendulum, or side to side, movement of the handles, and still more to the rotatory method, is a most dangerous delusion. I believe that as a power aiding the traction effort of the forceps it has no reality in fact, but that in its aptness for injuring the tissues of the mother and child its influence is most mischievous. In placing

myself in antagonism with the highest authorities upon operative obstetrics, — all the British, except Dr. Matthews Duncan, and all Americans, so far as I am able to discover, — as to a sweeping condemnation of lateral movements, I ought, of course, to feel very confident of my position, at any rate, to hold it as a matter of conscientious belief. There have been, among British, American, French, and German writers, all grades of opinion as to the degree of pendulum motion to be used, from the extreme views held by Barnes, Bedford, and Galabin, urging the necessity and immense advantage in all difficult cases, to the exclusively prohibitory teaching of Duncan and the Vienna school; and it may be instructive briefly to refer to the expressions upon this point among the leading teachers who have made it a subject of reference.

Some authoritative writers, such as Cazeaux, Tarnier, Siebold, and Scanzoni, have made no reference at all to this point in the method of traction; in small epitomized works on midwifery the omission might be looked upon as showing an adhesion to the ordinary practice, but in large works, such as those of the authors mentioned, when minute details are given of the whole procedure with careful directions for traction, silence must certainly be presumed to be condemnatory. Let us pass in review those who have spoken, arranging them somewhat in reference to the positiveness of their opinions.

Smellie seems to have been the progenitor of this traditional method, in advising traction to be made always from ear to ear, pulling the head along from side to side.

Bedford,¹ of writers in the English language, is most emphatic in his teaching of this method of traction, directing in his general rules that the traction effort should always be made *two thirds lateral and one third direct* or extractive. This he repeats again definitely in the special rules given.

Fritsch,² standing alone among authoritative German

¹ *Principles and Practice of Obstetrics*, New York, pp. 589, 592.

² *Klinik der alltäglichen geburtshülflichen Operationen*, Halle, 1876.

writers, advises either direct traction (which he considers very difficult for inexperienced operators), or *preferably* rotatory movements which are less dangerous, which tend to separate the combined mass of cranium and swollen vaginal tissues, and in cases of difficult diagnosis of position to solve the difficulty as to direction of traction by showing ultimately in what direction of the application of force the head moves most readily, and thus facilitating the labor by gradually bringing the greater amount of traction force into this direction. He makes no mention of any simple lateral effort, but speaks with great positiveness of the benefit of rotatory movements; he does not intimate any dangerous effects possible to the tissues, but simply refers to the annoyance of the blades moving between the head and the pelvic walls, if the movements are too rapid.

Barnes¹ advocates leverage from side to side with gentle traction; says that in many cases this gentle double leverage is enough to effect delivery; that *traction is hardly called for at all*; that *pure traction is impossible*; and that the leverage is economical of force, and gives greater safety to the mother.

Simpson² advocates side to side movement.

Meadows³ advises a side to side, and an up and down movement, enabling the operator to act as with a double lever, dislodging the head when *fixed in one position* (whatever that may mean) by a side movement.

Beatty⁴ also proposes to "loosen up" the head by swaying the forceps handles backward and forward, as though the head were adherent to the pelvic walls; and again intimates that by destroying these adhesions nature may be allowed to finish the expulsion; he speaks of *dislodging from its position* a head which had descended almost to the perineum, as though it had purposely taken refuge behind some protecting abutment of pelvic outgrowth.

¹ *Lectures on Obstetric Operations*, London, 1870, p. 37.

² *Selected Obstetrical Works*, Edinburgh, 1871, p. 36.

³ *Manual of Midwifery*, p. 224.

⁴ *Contributions to Med. and Mid.*, Dublin, 1866, pp. 49, 102, 112.

Milne¹ moves the handle in a "circular" direction, not either vertically or laterally.

Maunsell² moves the instrument slowly from pubes to perineum, and backward when high up; at the inferior strait, laterally. The alternate motion to be attended with slight extraction force

Gooch³ says if the traction is only lateral the head will not advance; if only direct, the blades will slip off; therefore he advises the effort to be *one third lateral, two thirds direct*.

Leishman⁴ says the swaying motion enables the operator to deliver with more safety than the vectis, which has its fulcrum on the soft tissues of the mother.

Ramsbotham,⁵ without qualification, advocates the slow waving pendulum-like sweep from handle to handle, and insists upon a continuance of it until the head is born.

Chailly-Honoré⁶ advocates lateral and antero-posterior leverage, without reserve.

Hodge⁷ thinks lateral motion gives great efficiency to the forceps effort, the longer the instrument the greater being the leverage, and on this account he considers the length of the French forceps a great advantage.

Meigs⁸ advises the swaying from side to side of the handles.

A. W. Edis,⁹ of London, in a recent article in the Obstetrical Society's Transactions, almost invariably resorts to the lever pendulum movement, and has nothing to say as to any reserve in its full operation, and quotes McClintock and others in confirmation of his views.

¹ *Principles and Practice of Midwifery*, 1871, p. 259.

² *Dublin Pract. of Medicine*, 1845, p. 161.

³ *Compendium of Midwifery*, 1832, p. 192.

⁴ *System of Midwifery*, Glasgow, 1873, p. 529.

⁵ *Principles and Practice of Obstetric Medicine and Surgery*, Am. Edition, 1855, p. 268.

⁶ *Traité pratique de l'art des accouchements*, 1847, p. 606.

⁷ *Principles and Practice of Obstetrics*, 1864, p. 254.

⁸ *Obstetrics, the Science and the Art*, p. 528.

⁹ *London Obstet. Trans.*, vol. xix., p. 81.

Galabin¹ stands forth as the champion of the pendulum movement, going into an extensive demonstration of the mechanism of its operation, and a defense of its scientific character upon mathematical grounds.

E. J. Hicks² also attempts a special pleading in reply to Duncan's paper in opposition, repeating Fritsch's claim of the tentative value of the leverage, in determining the right direction of traction.

Professor Robertson,³ of Charleston, regards leverage as one of the most important mechanical forces secured by the forceps.

These are some of the principal advocates of the use of the pendulum or rotatory movement unreservedly ; we now have another class, who, while conceding that the movements in question may sometimes be permissible, instinctively shrink from their unrestricted use, and caution against the dangers which attend upon them.

Naegele and Grenser⁴ teach that the head is to be moved by traction, exercised on the forceps, imparting at the same time alternating movements from one side to the other, or making them describe little circles of rotation ; but they add "the less the circles of rotation, and the more limited the lateral movements, the less are the genital soft parts exposed to injury ;" which, carried to its legitimate conclusion, might be claimed as strongly condemnatory, although probably not so intended. Stoltz and Aubenas of Strasbourg indorse Naegele ; stating, also, that the majority of French authorities speak of rotatory movements only to condemn them.

Schroeder⁵ considers that in difficult cases the efficacy of traction may be increased by lateral oscillations, and even permits rotatory movements, but clearly insists upon the

¹ *Obstet. Jour. Great Brit. and Ir.*, Nov. 1876.

² *Obstet. Jour. Great Brit. and Ir.*, May, 1876.

³ *Am. Jour. Obstet.*, New York, vol. v., p. 301.

⁴ *Traité pratique de l'art des accouchements*, Paris, 1869, p. 283.

⁵ *Manual of Midwifery*, Carter's translation, p. 173.

danger to the maternal tissues, and finally, toward the close of his chapter on the forceps, states that steady and continued traction in the same line is most effectual.

Dewees¹ fully advocates leverage by lateral movement, when the head is low down, but says it is not safe when the head is high up; the danger being great of making fulcra of the mother's tissues.

Elliott,² while conceding that it may be admissible in some cases, warns his readers against the dangers of a side to side movement, involved in the risk of making a fulcrum of the descending rami, and of causing vaginal lacerations, which he considers more likely to result in this way from forceps delivery than do perineal ruptures. He cites a case of laceration of both sides of the vagina caused by too great leverage motion.

Davis (D. D.)³ advises lateral movements, if used at all, to be applied with great caution, as they make the lateral parts of the pelvis by turns points of abutment or fulcra to the corresponding parts of the forceps.

Playfair⁴ cautiously states that while leverage action may occasionally be of value, it must always be subservient to traction.

Dunster,⁵ while he does not exclude oscillating movements altogether from the forceps operation, does clearly attribute the lacerations and plowing up of the vaginal walls to "forgetting the line of traction," and using an inexcusable amount of leverage.

Engelmann,⁶ in his valuable monogram on the forceps, says, "an oscillating motion antero-posteriorly should not be resorted to; laterally a slight swaying is often very effective, but it must be done with great care." That his tolerance of it at all is more from homage to traditional author-

¹ *Compendious System of Midwifery*, 1838, p. 232.

² *Obstetric Clinic*, p. 307.

³ *Obstetric Medicine*, 1836, p. 1120.

⁴ *System of Midwifery*, 1876, p. 429.

⁵ *The Use of the Obstetric Forceps*, 1877, p. 30.

⁶ *The Obstetric Forceps*, 1878, p. 9.

ity than from conviction, is clear when he concludes "the less of it the better for the maternal parts."

Clarke,¹ of Oswego, says that while leverage oscillations are not in imitation of nature, they may be used tentatively now and then.

We have then a few authorities repudiating lateral traction altogether.

Foremost among these, in the present day, stands Dr. Matthews Duncan,² whose forcible attack upon this movement caused no little surprise to those who had been blindly following the unquestioned authority of past dictation.

Carl Braun³ says the pendulum-like movement, consisting in moving the handles from one thigh to the other, should not be made, because the physiological passage of the head through the pelvic canal suggests nothing similar, and because an operation favorable for the mother can always be completed without employing these movements.

Gustav Braun⁴ dismisses the subject emphatically, saying that "the action of the forceps as a lever is a delusion; and the brilliant results reported in extraction by leverage movements have not been verified."

Litzmann,⁵ of Kiel, says "You will do best to avoid the pendulum and rotatory movements formerly recommended."

In this country the only systematic and uniform teaching condemnatory of this leverage movement, and insisting upon a direct traction in the median line, so far as I know, has been in the Obstetric School of the Philadelphia Lying-in Charity. The founder and first teacher in that institution, Dr. Warrington, while he makes little reference to the subject in his "Obstetric Catechism," conscientiously taught his classes to avoid lateral movement, as I myself, having received my first instruction in his lecture-room, can

¹ *Transactions of N. Y. Med. Soc.*, 1870.

² *Proceedings of Obstet. Soc. Edinburgh*, Jan. 12, 1876.

³ *Lehrbuch der Geburtshülfe*, Wien, 1857, p. 841.

⁴ *Compendium der Operationen Gynäkologie und Geburtshülfe*.

⁵ *Ueber die Behandlung der Geburt bei engem Becken*. Volkmann's *Vorträge*, No. 20, 1871.

assert from personal knowledge ; his immediate successor, Dr. Ellwood Wilson, followed his teaching upon this point scrupulously and impressively ; and for fourteen years of service as lecturers in the school, my colleague, Dr. Allen, and myself have continued the inculcation of the same views, and I have tried to impress upon my classes the dangerous influence and utterly unscientific character of this method.

We have now considered the various grades of opinion as to the propriety of this mode of making traction. We shall find that among those who advocate it there is even a greater variety of theories as to *how* it acts, or rather the method by which the changes in the relation of the head to the pelvis in its advancement are produced. Some maintain that each blade of the forceps is a separate lever of the first class, even after the head is grasped, each acting in imitation of the vectis ; some that the forceps is a double lever of the first class ; some, that the forceps and the head in its grasp forms one continuous lever ; and of these, again, there are contentious factions, some maintaining that it is a lever of the second class, the fulcrum being at the end of the blade, the power at the handles, and the weight between the two ; and others that it is an angular lever of the first class. Some (following Leishman) maintain that the compressing power of the handles as a double lever with the fulcrum at the lock is the efficient factor in the leverage delivery ; while others (with Galabin) take just the opposite ground, that this compression instead of aiding delivery rather retards it, by causing a compensating projection of the diameter perpendicular to the one grasped, and that so far as this special leverage is concerned we would be better without it. Then Dr. Hamilton, of Falkirk,¹ introduces a new principle of leverage, which he does not make clear to my comprehension, which he calls metaphorically "going round the tree," which requires his solid blade straight forceps applied sacro-pubically, in order to be effectual. Then, again, an enthusiastic M. D., who so longs to show his admi-

¹ *British and Foreign Med.-Chir. Review*, Jan., 1872.

ration for the pendulum motion that he proposes, in the last volume of the Transactions of the London Obstetrical Society, to apply his forceps to the breech and seesaw it out of the pelvis, finds this marvelous principle of leverage to reside in both branches as double levers of the second class, the fulcrum being something which he is pleased to call the "grip," and which, he says, "though produced by an unseen agent, is quite as effective as a material and visible tie." I should not waste time in referring to this last article, if it did not give me an opportunity to enter my protest against burdening the literature of obstetrics with such trash as this I have just quoted, more offensive than much of the same sort that we meet with in the records and discussions of our specialty, because it comes out under the sanction of a society of teachers and experts which we have learned to regard as the highest authority in the medical world. But, to return to our subject, we see that there is very far from unanimity as to how so important a power is utilized; that so far it has not been settled on what principle this force, so effectual, so indispensable, nay, by some considered all-sufficient in the delivery of the head, produces its marvelous results. Is not this fact an entering wedge by which we shall come presently to divide and cut away absolutely this pendulum-lever power from *any* participation in the real forward movement of the head? But then, again, we have various reasons assigned *why* this method of extraction should be applied; most of the authorities regard it as simply a desirable aid to traction, yet, as Playfair would have it, kept always subservient to traction; but Barnes covers the whole ground by saying that "pure traction is almost an impossibility," and if we could assent to this, it would be folly to attempt an argument on the other side. Some authors regard it as merely tentative, used for the purpose of starting the head, and ascertaining the easiest direction of effectual traction, while one teacher in high authority advocates it unhesitatingly as a compensation for the want of accurate diagnostic power in the operator.

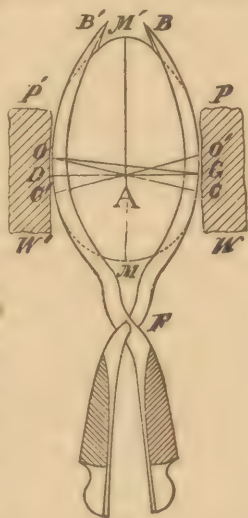
The assumption of any similarity in the forceps leverage

(oscillation), and the properly applied leverage of the vectis, is unwarrantable. Although Leishman¹ claims that the vectis will always be used as a lever whose fulcrum is upon the soft tissues, even though a finger may be interposed between the shank of the instrument and the point of pressure upon the pelvic wall, and therefore depreciates it strongly as an obstetrical appliance, I think few operators will sustain him in it. The vectis, used properly, should never make pressure upon the soft tissues as upon a fulcrum; on the contrary, it should be scrupulously kept from pressing upon the tissues by a thorough grasp with the hand which is in the vagina, the shank being drawn away from the pelvic wall by the thumb and last finger, while a counter-support is obtained by bracing the remaining fingers upon the opposite side of the head from the one upon which the change is proposed to be effected. Without this support and counter-support the vectis is a very dangerous instrument for the soft tissues of the mother and the scalp of the child. But suppose the same method be used in the traction with the forceps; the head being firmly grasped in the blades, a pressure with the fingers forming a fulcrum would simply have the effect of pressing the convex surface of the blade upon the side opposite to that on which the application of pressure is made, more forcibly against its side of the pelvic wall; it would not in any way change the relation of the maximum diameter, or its greatest transverse plane, the biparietal. The use of the forceps after the manner of the vectis would not impart to the handles an oscillating movement, nor to the head any change of position. An analogy, then, does not exist, and the force of it as an argument falls. The true analogue of the action of the vectis would be in the application mentioned by Fritsch,² when the introduction of the first blade to its position behind the posterior side of the oblique head gives a gentle leverage effect upon the head, favors its rotation toward the median line, and gives an impulse to the advance of the labor, which is then terminated without the necessity for introducing the second

¹ *Op. cit.*, p. 547.² *Op. cit.*

blade. Here the blade of the forceps is introduced, and held precisely as the vectis, when properly used; the lever being of the third class, the fulcrum being the hand of the operator grasping the handle, the weight the posterior part of the head, and the power the fingers of the hand guiding the convex edge of the blade into its position in the pelvis, and operating between the fulcrum and the weight.

Let us now come to consider the real mechanism of the pendulum movement. We must assume, in the first place, that the head is grasped with more or less firmness by the pelvic walls at the point of contact of the circumference of its greater transverse plane. This is surely a warrantable assumption, because I could not imagine any sane man claiming an advantage for leverage when the head was loose in the pelvis, any more than he would, in picking an egg out of an open bag, claim that he could do it better by an undulating motion of the hand. I cannot, then, assume less than that the head is firmly grasped by, and is in positive contact with, the pelvic walls, and that the forceps are applied to overcome the resistance to its advance caused by this pressure. Dr.



Galabin¹ himself advances the proposition that oscillation of the forceps will be of use only when the head is tightly gripped in the bony part of the pelvic canal. In order to understand clearly the mechanism of the forceps movement then, let us study this simple diagram. Let P W and P' W' be the pelvic walls in section made in the plane of the maximum diameter, and of that transverse diameter, the ends of which are grasped by the blades. Let M M' be the maximum diameter, corresponding with the axis of the canal, G D the transverse (whether biparietal or other), these two crossing each other at A,

¹ Op. cit., p. 517.

which will then be the centre of oscillation of the head in any pendulum movement of the handles, and the centre of motion in a direct traction. Let us draw through this centre two oblique diameters, OC , $O'C'$, and also from the extremity of the line GD an oblique line to a point O on the periphery of the head, nearer to M' . $FB B'$ will represent the blades of the forceps, through the fenestra of which the tissues of the scalp should protrude sufficiently to rest firmly against the pelvic walls, unless the blades be narrow, when the scalp tissue will come in contact with the pelvis at the sides of the blades.

What now will be the effect of traction by the various methods suggested? If, firstly, the handles of the forceps be drawn upon directly, without any compression or lateral movement, the blades will slide forward upon the head until they reach a position where the points come in contact with the convex surface of this farther extremity of the head; if then there be much head curvature of the blades, they will separate, until the convex surfaces are so firmly pressed against the pelvic walls that farther separation is prevented, and the force of traction will be then expended upon the farther extremity of the head by means of the points and the concave surface of the blades near the point. This represents the method of extraction advocated by the Vienna school. The head descends by propulsion from a *vis à tergo* from two sources, the uterine contraction, and the points of the forceps blades, and any moulding is done by the pelvis, no compression being made to diminish friction. If there be little head curve, that is, if the concave surfaces of the blades approach a parallelism, then with simple traction, without considerable compression, the blades merely slide between the head and the pelvic walls until they slip entirely off the head. Such would be the effect of traction without compression with blades like those of Hodge's forceps, which are narrow and with very little head curve, and the distance from the lock to the head grasp so small that with a large head to be held, the blades diverge not only to parallelism, but even beyond this, having the points

separated farther than the length of the transverse diameter of the head, so that all traction power is lost unless a firm compression be exerted.

If, on the other hand, we have swinging movement without traction or compression, then the blades of the forceps will glide up and down between the head and the pelvic walls, in no degree whatever changing the position of the head. If, further, we have traction and oscillation combined, without compression, then we have simply the double effect of the two, neither one aiding or interfering with the other.

Now let us suppose the head, grasped firmly, compressed sufficiently to make the head and the forceps practically a continuous bar, or, as Shroeder has it, "the forceps immovably united to the head standing in the pelvis," and let simple traction in the median line be made (which I must assume as a possibility from constant experience, notwithstanding Dr. Barnes' belief to the contrary), the handles not changing their direction, the maximum diameter maintains its correspondence with the axis of the pelvis, and the plane of the transverse diameter moves steadily forward, presenting, therefore, the same measurements, and preserving its relation with the pelvic planes.

But now again let us see what will be the effect of pure oscillation, or leverage, as it is called, with compression but without traction, the method recommended by Dr. Barnes. The first movement, say, will carry the handles toward W; the head, then, being "immovably united to the forceps," must rotate upon an axis passing through A, perpendicular to the transverse G D, which transverse also rotates, the extremity G moving upward toward P, and the extremity D correspondingly descending toward W'. But as the diameter G D moves, so does the oblique diameter O C passing through A move also proportionately; C following G upward, as O follows D downward, and the extremities of this oblique diameter come to assume the position, in relation to the plane of the pelvis, occupied, before the lateral movement, by the extremities of the transverse diameter. But we know that every oblique diameter of an ovoid passing

through the centre of the greatest transverse diameter is greater than that transverse, and that the increased length is proportionate to the distance of its extremities on the periphery from those of the transverse. The more considerably, then, we move the handle toward W, the more we place the longer diameter of the head in the position originally occupied by the transverse diameter. As the handles swing back approaching the median line, the diameter in relation with the plane diminishes until the handles pass the median and are made to approach W', when the same change takes place in the bearing of the extremities of the oblique diameter O' C', and this diameter takes the place of the transverse against the pelvic walls. Here, then, we have a demonstration sufficiently clear, I should think, to satisfy even the mathematical mind of Dr. Galabin, that oscillation without traction simply brings to press upon the pelvic walls, with a sort of slow vibratory impact, portions of the head farther separated from each other than the points which rested in contact with those walls before the swaying motion was started; that while the pelvic wall is subjected to alternations of excessive pressure and partial relief, there is nothing in the movement itself to advance the head an iota, the side which descends with the swaying of the handles in one direction, ascending equally (unless driven down by the *vis à tergo* which acts altogether independently of it) when the handles are swayed in the opposite direction.

But, lastly, we have the oscillations combined with traction and compression, the condition in which each side of the head alternately is fixed while its opposite is drawn down by the leverage of the forceps. To accomplish this accurately, proportioning the traction with the leverage so that the impinging point of one side shall be exactly maintained in its position, neither drawn forward by the traction nor forced backward by the leverage, would be a matter of nice practice, but I shall presume it to be done by the expert operator. Traction and lateral motion are thus combined so that while the handles are carried to-

ward W, the extremity G of the transverse axis does not move in its relation to the wall P W, and the blade resting between them simply rocks with its extremity B moving toward the opposite side of the pelvis; but the opposite blade, by the motion imparted by its handle, must move forward upon its side of the pelvis, thereby drawing the point D, the extremity of the transverse diameter, with it, and carrying down to take its place the point O, the end of an oblique diameter drawn from the fixed point G to some point upon the opposite side nearer to the pole of the ovoid than the transverse. Now as the transverse diameter is less than any oblique line drawn from one of its extremities to the opposite circumference, this motion must cause to press upon the opposite surfaces of the pelvis the extremities of a diameter longer than the transverse diameter. Here, then, we demonstrate clearly that *leverage with traction* is simply *traction plus an aggravation of pressure* upon surfaces already so tightly compressed by the circumference of the child's head as to obstruct its advance toward the outlet of the pelvis. It follows from this demonstration that every oscillation, every pendulum movement, changes the position of the head into a less favorable one, by altering the relation of the maximum diameter to the axis of the pelvis, and it has been to me a matter of great wonder that so clear-headed and accurate a teacher as the late Professor Hodge,¹ who maintained with so much vigor and tenacity his views as to the necessity of preserving the synclitism of the fetal head in the mechanism of labor, should have loosely assented to a method of forceps delivery which can only act by destroying that synclitism.

Is it not easily demonstrable, then, that the leverage proposed by Dr. Barnes as sufficient in itself without any traction, is really, so far from being an economical expenditure of force, an absolute waste of force, as it cannot advance the head, and whatever amount of force is expended exerts itself in simply grinding the blades of the forceps backward and forward upon tissues compressed already by the head,

¹ *Am. Journal Med. Sciences*, October, 1870.

and in many instances tumefied and threatened with sphacelus by long continued pressure before the blades were applied. But, it may be urged, the head advances under this leverage, therefore there must be some fallacy in the reasoning. It does advance in many cases, because the uterine contraction propels it, being stimulated by the presence of the blades, and there is brought into action the *dynamical* power of the forceps, as it is curiously called, the power derived from irritation of the uterine or cervical tissue by the pressure of a foreign body. This propelling force, then, is in itself entirely independent of the oscillation, is not aided by it, but, if anything, obstructed; and we are left with no advantage gained by our forceps except the development of the uterine contraction, for the production of which abdominal frictions would be equally effective, less dangerous, and less annoying to the patient than the putting on of a pair of long forceps to see-saw about in the pelvis. If abdominal friction fail, many other uterine stimulants are at command safe and easily applicable.

But it is the oscillation with traction that is most generally advocated, over which Dr. Galabin's enthusiasm is aroused, as he sallies forth so valiantly to repel Dr. Duncan's attack upon his venerated traditional method. While he rejects the palpably absurd explanations of the principle of leverage given by Playfair and Leishman in their efforts to reconcile themselves to the oscillatory movements, he grasps cordially the hand of Schroeder, who furnishes him with the idea of a fixed fulcrum upon the vaginal walls, and a one-armed, angular lever. But it would seem as though he could derive little comfort from his ally, for Schroeder evidently has no confidence in the efficacy of oscillation, for he makes one condition of this leverage the "immovable union" of the head to the forceps by compression, after having a few paragraphs before stated that the forceps should never compress the head more than sufficiently to keep them from slipping, and that his ideal forceps would be one that made traction without any pressure whatever upon the sides of the head. Schroeder's prin-

ciple of leverage, then, is incompatible with his idea of the proper function of a forceps.

But what is this admirable fulcrum upon which the lever rests for support, and what is the weight or resistance against which the end of the lever is pressed, in the prying or crowbar motion imparted to it? Are they firm, bare, hard, bony surfaces? No. They are soft tissues, perhaps portions of prolapsed cervical tissue, edematous, contused, pressed down before the head; generally, however, congested, bruised, squeezed, vaginal walls, with connective tissue beneath tightly compressed between the head and the unyielding bony walls of the pelvis. Is such a fulcrum for the powerful leverage of an iron bar a desirable one inside the body of a living woman? Does Fritsch¹ forget what he has told us of the condition of the tumefied cervix, and the folds of swollen and congested vaginal tissue pushed down before the advancing head, if it fits at all tightly in the pelvis, when he becomes so ecstatic over the wonderful effects of the gyration of the forceps handles? Does he ignore the fact that his much lauded rotatory movements, so *useful to aid the inexperienced practitioner in detecting the proper direction of traction*, are grinding these parts, so well disposed already for sloughing, between the clamped head and the pelvic walls? Now it will be admitted that, if the pelvic canal were simply a bony canal, and the fetal head a hard, unyielding body, by the mathematical demonstration, the use of oscillation with traction would be impossible, because the operator could not bring about changes in the relation of the head to the pelvis, involving an increase of diameter, when those already in contact fully occupied the diameters of the canal. Therefore, any such leverage in the movement of a living head, in a living pelvis, must be possible only by an increase of mutual pressure, such pressure being expended in condensing the soft tissues upon the pelvic walls, and diminishing by compression the measurements of the head between the two opposite points of contact with the vagina. And this diminution in bulk of the

¹ Op. cit.

head by this process would be aided by the necessarily closer approximation of the blades of the forceps, as will be seen by reference to the diagram. If the handles are drawn toward W, the forward portion of the blade upon that side, and the hinder portion of the opposite blade, would both be driven in toward the maximum diameter of the head, thus aiding the pressure against the pelvic walls in diminishing the transverse diameter. It seems strange that those who so stoutly oppose a rational and judicious compression of the head in the forceps blades to diminish friction against the vaginal tissues, should be so willing thus unscientifically to squeeze the head in the forceps' grasp, and urge it to outrage the soft tissues by this prying, handspike movement.

Dr. Galabin lays great stress upon what he supposes to be the effect of the leverage in diminishing friction, by converting statical into dynamical friction; in fact he becomes so lost in his admiration for this wonderful *vis vectis* that he conceives it to be able to defy the laws of mechanics in *converting statical friction into a force*, aiding in the extraction of the head. Now, if my demonstration of the mechanism of oscillation have any value at all, it must show that the leverage motion in every way increases friction by increasing pressure laterally. Dr. Galabin makes a distinction, which I cannot grasp, between friction and pressure. Now what is friction except the resistance to motion caused by the mutual pressure of opposed surfaces? How can one exist independently of the other? But inasmuch as friction is really the only obstacle to the advance of the head, why not get rid of it altogether (instead of converting one kind into another) by making a steady traction, compressing the head in the grasp of the blades just enough to take off the pressure from the embracing tissues. Even Scanzoni¹ admits that compression is justifiable to the extent of overcoming resistance, and that is all that any of us, the most tenacious advocates of the compressing function of the forceps, will care to claim.

Now what are the positive arguments in favor of direct

¹ *Lehrbuch der Geburtshülfe*, Band iii.

traction? *Firstly*, It is in accordance with the methods of nature. It imitates the operation of the uterus, and is compatible with that most important rule of making the forceps simply an instrument for filling up the deficiency in the expulsive power of the uterus. Nature never in any condition of labor, easy or difficult, expends her powers in seesawing the child's head in the pelvis. *Secondly*, It economically expends the whole force in the direction of motion. It is a clear and incontrovertible principle of mechanics that the more nearly the direction of traction corresponds with the direction of motion, the less is the amount of power wasted. If, then, we are drawing in the direction of the pelvic axis, not only in reference to its curvature from brim to outlet, but also to its plane passing vertically through the median line, we are utilizing our whole forces expended, and every movement of the head is an advance movement; but if we are drawing with a lateral motion of the handles, just in proportion to the amount of that lateral movement are we dragging the head against the pelvic walls. Now just as Tarnier¹ enters into a mathematical calculation as to the amount of force wasted in dragging the fetal head against the pubes by a deviation in traction from the direction of the curved axis of the pelvis anteriorly, so we might make an equally significant and accurate estimate of the power wasted in dragging the head against the lateral walls of the pelvis by the pendulum traction. When Dr. Bedford² tells us to exert our traction two thirds laterally and one third direct, he simply practically tells us to expend one third of our force in drawing the head in the direction we wish it to advance, and two thirds in dragging it against the walls of the pelvis through which it cannot go. Or we might put it in reference to the ethical bearing of the operation, to expend one third of our force in aiding nature in the expulsion of the child, and two thirds in trampling upon the laws of nature by the wanton bruising of the child's head against the tender and, perhaps, already mutilated tissues lining the pelvic cavity.

¹ *Description de deux nouveaux forceps*, Paris, 1877.

² Loc. cit.

The most frivolous arguments in favor of the pendulum movement of the forceps are those drawn from mechanical analogies, the double rack, the corkscrew, the pincers and nail, and the ring on the finger. Now with the exception of the last which is the recent conceit of Dr. E. J. Hicks,¹ these analogies are all from mechanical tools operating upon inanimate bodies, in the movement of which generally no care of the integrity of surfaces enters into consideration.

The fallacy of the double rack argument has been most fully shown, by Dr. Matthews Duncan in his paper before referred to, in the entire absence of any condition in the pelvic canal approaching the character of a rack or toothed bar, and the clear duty of the obstetrician, if there were such a condition, to draw the head over the unevennesses as smoothly as possible; and I would add from Dr. Galabin's own argument, the fact that not only is there no toothed abutment against which the head can be rested by each alternate movement, but that unless the traction be very powerful the point of the head just advanced by one leverage, will go backward in the pelvis when the forceps are swayed to the opposite side.

As to the corkscrew extraction, no corkscrew or mechanical appliance has ever been suggested, so far as I am aware, which would act by passing the separated blades of a pair of pincers along each side of the cork and making traction. When such an arrangement is devised I feel quite clear in predicting that it will be the direct steady pull with compression that will bring the cork out safely, and the lateral oscillation that will shiver the neck of the bottle to atoms. (The poor pelvis unfortunately subjected to the same treatment does not shiver to atoms, it simply bruises and tears and sloughs.) But if it is the cork extraction such as Dr. Galabin uses as an illustration, the *short* cork shoved from side to side by pressure upon the protruding portion, there would seem no analogy except in the extraction of a head which is already partly expelled beyond the vulva, sufficiently to be seized and enucleated by lateral pressure upon

¹ *Obstet. Journal of Great Britain and Ireland*. May 1876.

the perineum or through the rectum. But suppose it is claimed that the part of the cork projecting beyond the neck of the bottle represents the forceps' handles beyond the vulva, the analogy still amounts to nothing; for in the one case we have the firm, inflexible iron bar, in the other a soft, elastic, flexible body. And really the leverage of the cork amounts to nothing but the pulling out by direct traction of one side at a time; so that, by virtue of its elasticity of form, when lengthened in one direction it is diminished in the perpendicular direction, and each side being thus successively diminished in bulk is easily drawn forward, and the lower portion, expanding first, prevents the return to position of the whole body of the cork. Now this is just what is done in the extraction of the fetal head by direct traction with compression, only that instead of alternate sides being lengthened and narrowed to diminish the friction, the whole is lengthened and narrowed at once by the mutual compression of the two blades.

The "nail in the board" analogy is equally sophistical. It is true that if we have a nail in a board and we wish to remove it, we may take a pair of pincers and draw it out very much more easily by swaying those pincers backward and forward; but how do we do it? By enlarging with every side movement of the pincers the hole into which the nail is driven, until at last having the hole so large that no pressure is exerted in producing friction, the nail would drop out of itself. But do the friends of the pendulum traction propose to treat the pelvis in this way? Would it not be better to treat it as we would a piece of finely polished wood into which some mischievous child had driven a nail and from which we wish to draw it so as to leave as little blemish or injury as possible? Would we not in that case seize our nail head carefully, and drawing as accurately as we could in the direct line of the nail, steadily pull upon it, avoiding any trace of a lateral movement? Does not the illustration of the nail in the board furnish our side of the question with about as cogent an argument as can be drawn from mechanical analogy?

Dr. E. J. Hicks' comparison of the removal of a ring from a swollen finger, founded on the existence of swelling of the vaginal tissues in front of the descending head, would be forcible if it were proposed to draw the bone through the ring leaving the swollen tissues behind it, as is the case with the head drawn through the pelvis; and really it does give us a very apt illustration of the effect of oscillation in dragging the soft tissues away from the pelvic ring along with the head which corresponds with the phalanx of the finger in his analogy. Yet he thinks, evidently with much self-complacency, that he has demolished Dr. Duncan beyond any chance of repair. The method of removing the ring is simply like the taking of the cork from the bottle; the skin is tightened up above the ring on one side, making it thinner when the ring presses against it, and straightening out the folds in front of the ring, and thereby diminishing the resistance. If we could get in behind the fetal head and draw up the vaginal tissues which are the seat of "puckering and œdema" we might imitate the ring movement; but in fact there is no condition of the pelvis in which we can do more sure outrage to the tissues by the pendulum movement than just this very state of "puckering and œdema," when the oscillations are made to grind away alternately, first one side, then the other. I would not spend time on these illustrations except that arguments from the analogy of nature in ordinary mechanical processes are particularly effective, and it is important to show to those who might be influenced by them their utter fallaciousness in establishing anything except a confirmation of our arguments.

Dr. Galabin¹ replies to Dr. Duncan's claim that there is more power at command for direct traction than can ever be needed, and that therefore oscillation is unnecessary as an economy of force, even if proved to be such, that there are cases reported in which two operators have required their combined strength upon the handles to effect delivery. I presume he means in making direct traction. But I have

¹ *Op. cit*, p. 515.

seen cases where two men, and strong men at that, have had applied to the head heavy, powerful forceps, and bracing themselves against the bedstead have swayed the handles backward and forward, fairly dragging the patient over the edge of the bed, and yet not moving the head in the least, and they have proposed perforation and craniotomy as a necessary resort, and with my little Davis' forceps accurately applied, making *direct* traction and making it in the curved axis of the pelvis (which can never be done with feet braced against a bedstead), I have easily and without effort delivered in some such cases living children. There are other elements beside direct traction entering into the problem of success with the forceps; there must be traction properly directed, and compression sufficient to diminish resistance, and forceps with proper grasp, and properly applied to the sides of the head.

Dr. Galabin¹ himself admits that the oscillation, to be effective, must be accompanied by firm *compression* of the head and the *utmost tractive force* which is considered permissible. In this connection I would ask, What can be more inconsistent than for one of the German school, with their holy horror of the compression of the head with the forceps, to advocate, as Fritsch does, the use of oscillations upon a head grasped by blades whose pressure ought, according to Fritsch himself, to be so slight as to permit free rotation of the head within their concavities in executing the mechanism of labor? Now I will guaranty, unhesitatingly, that any head which can be delivered with oscillation at all, can be delivered without it with the same amount of compression that Dr. Galabin says is required to keep the forceps from slipping and deranging the lever, and with vastly less traction than he says is required in what he calls "fixing the fulcrum." If compression is to be exercised upon the head (and I am a firm believer in the utility and even necessity of a certain compressing effort), is it not better to expend it in a well-directed effort to diminish friction, which is its great function after all, and aid delivery in

¹ Op. cit., p. 517.

accordance with nature's own laws, than to waste the force in making an "immovable union with the head" for the sake of forming a lever with which to pry the head against the opposite wall of the pelvis instead of bringing it directly down between the walls with uniform movement of both sides; or in using it to "fix a fulcrum" upon the soft tissues for the purpose of converting statical friction into dynamical instead of employing it to overcome friction altogether? I ask for no more compression than will overcome resistance; Dr. Galabin will certainly admit that if we overcome resistance we accomplish everything that the forceps are required to do. He claims that in order to make the leverage motion effectual we must grasp the head with *firm* compression; I would ask *no more* than enough to take the pressure off the pelvic walls and overcome resistance. I use my compression in advancing the child's head by diminishing the necessity for powerful traction, while aiding the uterine *vis à tergo* to act more effectually; Dr. Galabin uses his compression merely as a preliminary or preparatory process to enable him to bring to bear his leverage with traction, which latter has then to be used to the utmost extent permissible. Admitting, then, that my compression and my traction are both as great as his, — which really I doubt, — we have the delivery effected in the one method by compression and traction, in the other by compression and traction plus oscillatory leverage. If I have proven that this oscillation is a waste of force, and especially that it endangers the tissues, may I not surely claim for the direct traction an immense gain?

I have been told that it is because of superior muscular strength of the operator that direct traction is rendered effectual. To admit this would be to yield the whole question. The idea of being able to use strength more economically by leverage motion is a delusion which I can see will very easily take hold of one; for in swaying the handles of the forceps the operator seems to be doing something, while in direct traction the movement is slow and almost imperceptible. Here we have coming in the impatience of the

operator, the element of "fussiness," as Dr. Duncan so aptly calls it, which makes one so anxious to *appear* to be working effectually, and finally persuades him, like the fly upon the chariot wheel in the fable, that he is accomplishing much with his pendulum movement, when in reality it is all being done by other forces.

As I stated in the early part of this paper, my practical experience has fully and invariably confirmed my theoretical views. I have seen the great facility with which delivery could be effected by direct traction in the median line where experienced operators had failed to make any progress with oscillations; and I have seen such frightful lacerations following the pendulum and rotatory movements in patients whom I have easily delivered afterwards without them, that I cannot but feel that the method of delivering was responsible. If time were allowed I might give the details of a case, where one of my patients with slight pelvic contraction, under the treatment of an operator called in in my absence, was subjected to rotatory movements, with Bethell's immense forceps, the handles lashed together, and the foot of the operator braced against the bedstead, and had the rim of her cervix literally ground off against the pelvic walls, and found hanging by a slender strip in the vagina. My lamented friend, Dr. George Pepper, confirmed by examination what my own senses almost refused to accept. This rotatory motion had been kept up for over two hours without advancing the head in the least, by a man of large obstetric experience, but thoroughly taught by the "old masters." I arrived as he was proposing to perforate the head, and taking charge of the patient, I extracted the child in twenty minutes by direct traction with Davis' forceps, applied above the superior straight. On making a delivery of the placenta I found the condition described above.

The conclusions I would draw at the close of my paper, are: 1. That pendulum movements are in direct violation of the teachings of nature; 2. That they are absolutely useless so far as any aid to traction is concerned; 3. That any

virtue they have is in stimulating uterine contractions, which then act independently of them ; 4. That so far from diminishing friction they increase the mutual pressure of the head and pelvic walls, thus increasing friction ; 5. That they tend to do injury to the pelvic tissues, no matter at what point of the pelvis they are practised ; 6. That so far from being specially useful when the head is "tightly gripped," to use Dr. Galabin's expression, and the extraction difficult, the greater the difficulty of the case the greater, necessarily, is the injury to the tissues.

If I am asked why so many cases are delivered successfully by their use, I say I believe the success is in spite of them and not because of them. And I am sure that any one who will expend the same effort in direct traction with compression that is required in traction and leverage with compression, will find the delivery more rapid, more easy, and attended with less vaginal abrasion.

The amount of time that I have occupied, and the degree to which I have been willing to burden the Society with this subject, I hope will be a guaranty of the deep earnestness I feel in the duty of establishing in the opinions of others the position that I have taken. I believe this to be one of the most important factors in the solution of the problem of how to bring a living child through a living pelvis in the absence of effective uterine power, with the least danger to mother or child.

I wish to express my admiration for the ingenious method of argument by which Dr. Galabin strives to support the traditional rule of practice, and I cannot but feel that if he had expended his superior logical powers upon the side of scientific truth, he would have done far better than I have done.

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